DESIGN OF GOLF SKILL TEST

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William Kaye, Jr.

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DESIGN OF GOLF SKILL TESTS

By

William Kaye Jr.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Whether golf is a sport, game, or an entaglement of many swings, it's an activity that provides enjoyment and recreation for almost all that drive the small white ball from hole to hole.

Many think that golf is for the wealthier class, but this has been proven a misconception by the increasing number of participants who spend their leisure time playing golf. Also, many think that it's difficult to obtain a high degree of skill in this fascinating past-time. It's perhaps true to state that participants who play golf make it seem much more difficult than it actually is. Practice and the understanding of what makes the ball react in various ways will definitely lead to lower scores.

Most participants of golf are constantly attempting to improve their game. It is an endless proposition to perfection because of so many variables that can affect a golf shot.

There are many writers of books, articles, and pamphlets on how to play golf, but few authors who have attempted to find the methods of testing for the skills of the sport. In this study the investigator will try to develop a skill

test that will give the educator or golf coach a way to evaluate how much skill a student has in golf by correlating simple skill tests to actual golf scores.

I. NEED FOR THE STUDY

Golf, as a unit of instruction in Physical Education, is rapidly gaining stature and popularity throughout the United States. This is only natural in view of the game's tremendous following, coupled with the fact that one of "Physical Educations" most important objectives is the teaching and developing of sport skills that have a carry-over value. Every sport now being played, has tests developed for its use in conjunction with instructions, but most golf skill tests are time consuming, expensive and not practical to administer. Probably no other sport claiming so many participants is so completely ignored by researchers. This attitude is best summed up by the common statement that "golf makes its own tests." Evidently accepting this theory, few people are investigating any further. Under this asumption, it is felt that the development of a skill test that correlates with actual golf scores would enhance the teaching and learning of the game of golf.

The purpose of the Study. The major purposes of this study are three in number. They are (1) To design a skill test that correlates with actual scores. (2) To predict

golfing skill by the use of the skill tests designed. (3) To evaluate the HPR 105 Golf Skill Test that is in use at Michigan State University.

The skill tests designed for this study are:

1. A Driving Test for Accuracy and Distance.
2. A Putting Skill Test.
3. A Chipping Skill Test.
4. A Five-Iron Test for Accuracy and Distance

Also, a Knowledge Test and the HPR 105 Golfing Skill Test used at Michigan State University are included. The Knowledge Test was included for the purpose of finding if a knowledge of the game had a correlation with subjects scores. The HPR 105 Golfing Skill Test was included to find if the test had a correlation with a test using an actual golf ball. In the HPR 105 Golfing Test, a plastic ball was used for distance. The prediction of golfing skill is based on 205 subjects using the tests designed. The norms of these subjects are included in Chapter IV of this study. The factors that the investigator feels important, if this prediction can be accomplished are:

1. A Driving Test for Accuracy and Distance.
2. Putting Skill Test.
3. Distance of Five-Iron with Whiffle Ball.
4. Chipping Skill Test.
5. Five-Iron Test for Accuracy and Distance.
6. A Knowledge Test.

This does not mean that the score on all six tests correlate with actual scores, but one of the study's objectives is to discover the most efficient number of factors correlating with a subject's score.

Limitations.

1. The golfing area where the tests were given was not as smooth as a country club's faorways
2. The green used for the chipping and putting tests was rough since the study was held in the Spring of the year.
3. The limited number of subjects was a limiting factor.

II. DEFINITIONS OF TERMS USED

The golf terminology that requires explanation in this study is listed below.

1# Wood or Driver. A wooden ended club which is used to get distance from the golf ball. It is the longest and most delicately constructed club in a golfer's bag and is the evolution of generations of experiments. Many golfers carry two drivers, one with a stiff shaft, and the face squarely up and down to be used when one wants to keep the ball low, and another with a spoon face to sky the ball when playing the wind. The average golfer hits his drive between 180 and 230 yards.

Five-Iron or Mashie. A club that has an iron face so that a ball may be hit for distance and accuracy. The angle of a Five-Iron's face is thirty-two degrees. The

average shot with this club carries between 150 and 170 yards.

Seven-Iron. In this study the Seven-Iron will be used only for chipping. It has an iron face and is considered to be a short Iron. It has a face angle of thirty-nine degrees. The average distance achieved with this club is approximately 135 yards.

Putter. A club that is used to stroke the ball so that it will roll across a relatively smooth surface. This club is usually used on the green. The clubs face is square. Putters have varying head shapes.

Slicing. Slicing is bringing the club head across the line of flight with the forward swing so that a clockwise spin is given to the ball. This is done either by pulling in the arms with the concussion or by facing so far around that the club head naturally swings across the line of flight. A slicing ball will travel in a left to right arc.

Hooking. A ball that curves to the left when hit by a right-handed golfer. Hooking is caused by swinging the club from an inside to an outside arc, thus cutting across the ball imparting a counter-clockwise spin. Most professional golfers agree a slight hook assists in achieving greater distance.

Putting. Although approach shots are perhaps the most difficult ones to make, in nine out of ten games

putting is what wins or loses the hole. The six factors that need to be taken into consideration when putting are:

1. The distance of the ball from the hole and the force needed to propel it over that distance if the green is flat, of average pace, and there are no complications.
2. The state of the green, regarding wetness and softness, or dryness and hardness, the length and texture of the grass, and subsequently its relative speed.
3. The extent and the character of the various inclines and undulations upon the green in the immediate neighborhood of what, at a rough estimate, seems to be the line of the putt. These factors affect the run of the ball, and act and react upon each other, and therefore affect the true line of the putt. (The speed of the green, as already determined, will need to be taken into consideration in making this calculation. The faster the green the greater the course of the ball is affected by slopes.)
4. The exact nature of the surface of the green along the line of the putt as already determined, and how the character of the surface, and therefore its speed, varies along the whole length of that line, particularly in the neighborhood of the hole

where the ball, with its motion almost gone, will be more susceptible to such variations than earlier in its journey.

5. The direction in which the wind is blowing, and the extent of its influence upon the ball.
6. The question as to whether the green has just recently been cut or not, and if it has been, the direction in which the mower passed over it relative to the line of the putt.

Chipping. A ball that lies within fifteen years of green requires some type of a shot to get it on the green. This shot is called a "Chip." A chip shot may be executed with any club. In this study a Seven-Iron will be used for chipping. With a Seven-Iron the ball will fly one-third of the distance to the hole and roll two-thirds of the distance.

Stance. The position a player takes when addressing the ball. This position may change with the use of different clubs or different shots.

Whiffle Ball. A plastic golf ball that is used in the Five-Iron Whiffle Ball Test. The plastic ball used in this study will fly up to approximately 100 feet.

III. SOURCE OF MATERIAL

Since the investigator could find no work in regard to establishing golf skill tests that predict golf scores,

this phase of this paper is original. A few related studies have been used for comparison only. The two tests not developed entirely were "The Knowledge Test" constructed by Mary Murphy,[1] and the "Five-Iron Test" used by Michigan State's Physical Education Department. Murphy's test has the Pearson product moment of .92 correlation. Therefore, after examination, the investigator felt that this test would suffice for the need of this study.

IV. SUMMARY

Following a review of related studies, the procedures used to design each test will be found in the following chapters. In a direct manner, an evaluation of the golfing test given in the HPR 105 class at Michigan State University will be obtained by correlating the Whiffle Ball Test and an Actual Ball Test using the same iron.

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[1]Mary Murphy, "Criteria for Judging and Golf Knowledge Test," Research Quarterly, III (September, 1933), p. 81.

CHAPTER II

REVIEW OF THE LITERATURE

As is so often the case when one is investigating or experimenting with a problem, the available material previously written is negligible. Although several people have done some work with golf tests, few have written of their results. Many professional golfers have written articles on how to practice golf shots. The investigator examined the golf Library located in Chicago, Illinois and found that there was no information indicating that this study had previously been done. The approach and design of this study is considered to be original and is the first to try to predict a golf score from a test of golf skills.

In 1931, Griffith found that blindfolded golf pupils surpassed a sighted group of golf pupils after their blindfolds were removed.[2] He proved that keeping the eye on the ball was for balancing purposes and not for receiving helpful visual cues.

Also, in 1931, Clevett wrote of tests he had set up to aid him in comparing different methods of presenting

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[2]Coleman Griffith, "An Experiment on Learning to Drive a Golf Ball," Athletic Journal, II (1931), pp. 11-13.

golf instruction.[3] However, as he pointed out, these were for practicing purposes. He developed three for use indoors, they were as follows:

1. Brassie. Mid-Iron Test. This test was given in a golfing net. The target was ten foot square, marked off into twenty-five areas each of which was twenty-four inches square. Pupils were tested on ten shots each with a Brassie (Two-Wood) and Mid-Iron (Two-Iron) from twenty-one feet away directly in front of the net. Point values of the areas are as shown in Figure #1. Balls striking to the left side of the target were scored higher than those striking the right side, since Clevett maintained that a ball which struck the right side was slicing. No practice shots were allowed in the tests.
2. Mashie. The mashie test (Five-Iron Test) was designed for indoor use to determine an individual's ability to make a short approach shot from the nearest edge of the target. The target was constructed of gymnasium mats marked off into twenty-four areas. The overall size of the target

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[3]Melvin Clevett, "An Experiment in Teaching Methods of Golf," Research Quarterly, I (December, 1931), 10.

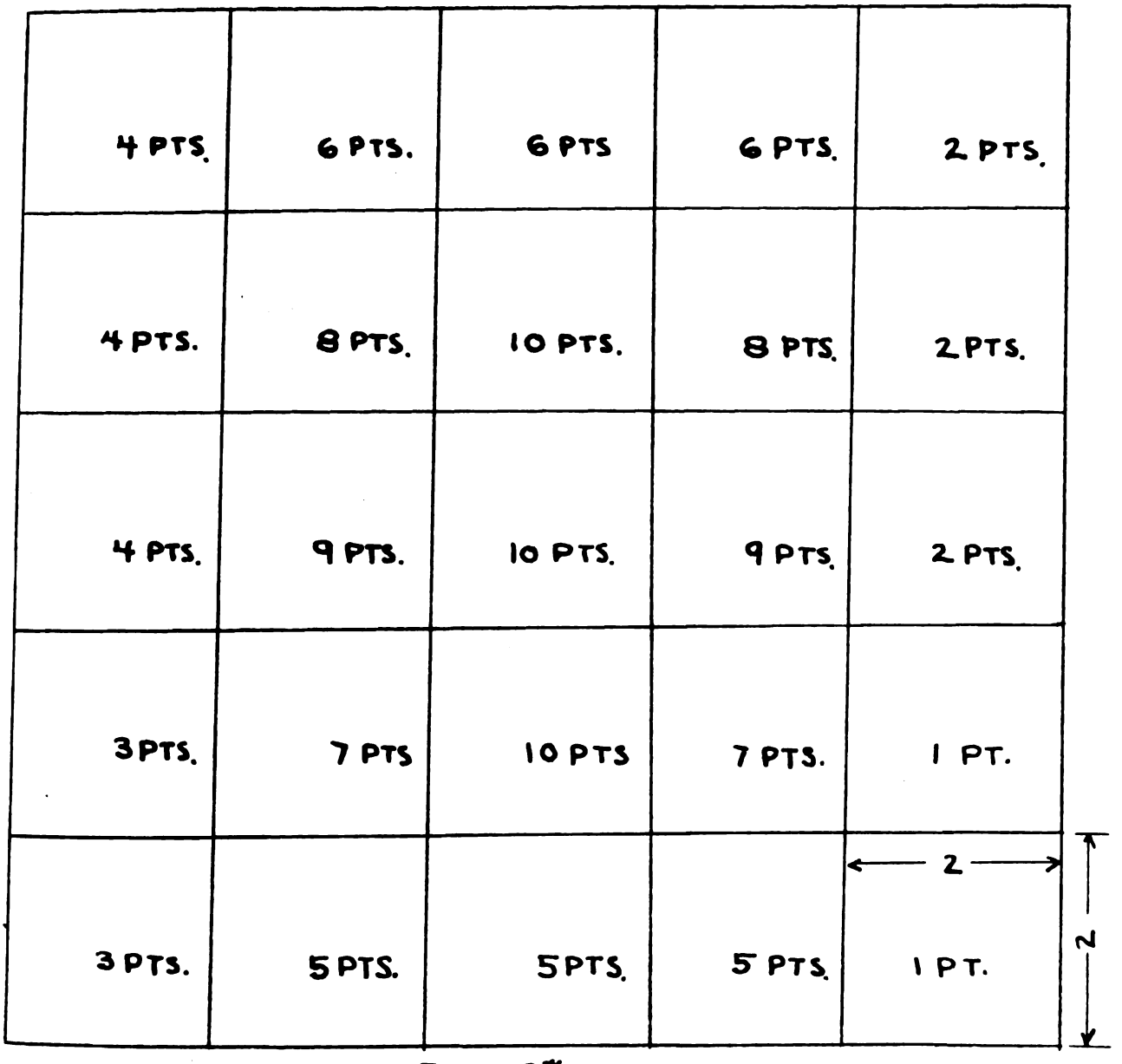

FIGURE #1

CLEVETT'S DRIVING NET FOR BRASSIE AND MIDIRON TESTS

was twenty-two feet square. Point values for the various areas were permitted and they were scored according to where they landed rather than where they stopped rolling. No trial shots were permitted. (See Figure #2).

3. Putting Test. The putting test was performed on a smooth carpet which was twenty-seven inches wide and stood fifteen feet from the hole. The hole was located in the farthest third of the target. No practice shots were permitted.

In 1933, Isabel Woods set up tests to measure the ability of a player to control the Brassie and Mid-Iron. She also tested the value of a driving cage. As a result she found that an expert player tended to send his shots to a concentrated area on the target, and that this concentration was higher up on the target for the Mid-Iron than it was for the Brassie. Miss Woods did not find a sound method of measuring putting, nor did she attempt to establish the validity or reliability of her tests.[4]

Elizabeth Autrey made use of Miss Woods tests and some of her own to measure the ability of a group of college women golfers.[5] Miss Autrey set up the following tests:

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[4]Isabell Woods, "A Study for the Purpose of Setting Up The Specifications of a Golf Driving Cage Target and Test for the Mid-Iron and Brassie Clubs" (unpublished Thesis, University of Wisconsin, Madison, 1933), p. 6.

[5]Elizabeth Autrey, "A Battery of Tests for Measuring Playing Ability in Golf," (unpublished Masters Thesis, University of Wisconsin, 1937), p. 10.

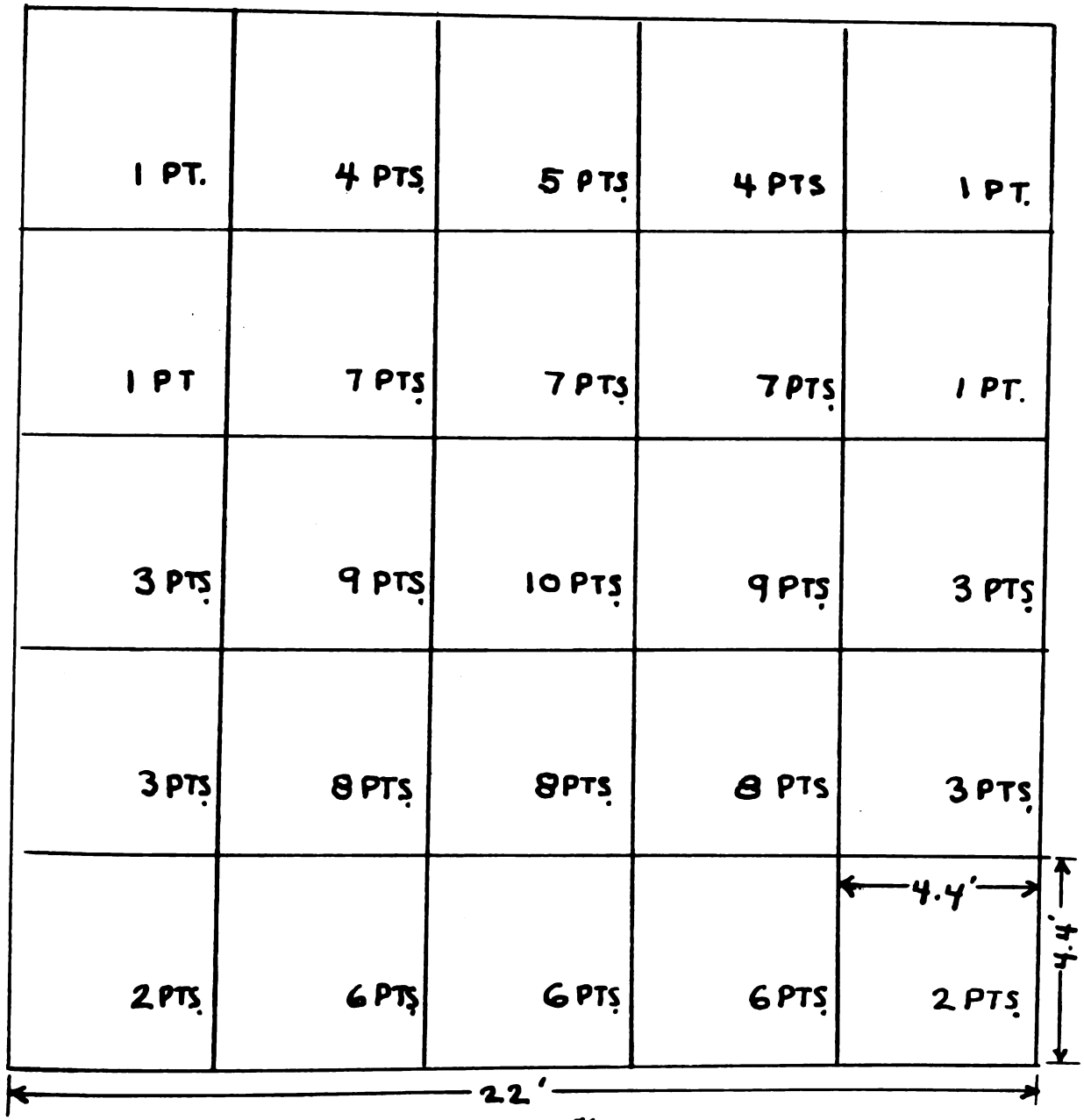

FIGURE #2

CLEVETT'S APPROACH TARGET
FOR INDOOR SHORT APPROACH SHOT

1. The Brassie. The target was four concentric circles, the center of which was five feet above the floor. The center circle had a radius of two feet, and each of the others were one foot larger. Players stood twenty feet from the target and hit thirty balls into scoring areas as shown in Figure #3. Norms were established, as was a reliability score of plus .68 for forty-three cases.
2. Approach. Five concentric circles of eighteen feet to fifty feet radius composed the target. Students hit thirty balls from fifty yards away after four practice shots. Balls were scored where they stopped, and were given points as shown in Figure #4. Reliability score for this test was .44 - .08 for forty-three cases.

Golf Instructor's Tests. Along with her group instruction drills, Helen Schleman mentioned a few tests that might be used.[6] The first of these was a pitching test, the second, putting on a rug, the third, for long and short approaches, and the fourth was a driving test. Her tests were as follows:

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[6]Helen Schleman, Group Golf Instruction (New York: A. S. Barnes and Company, 1934), p. 49.

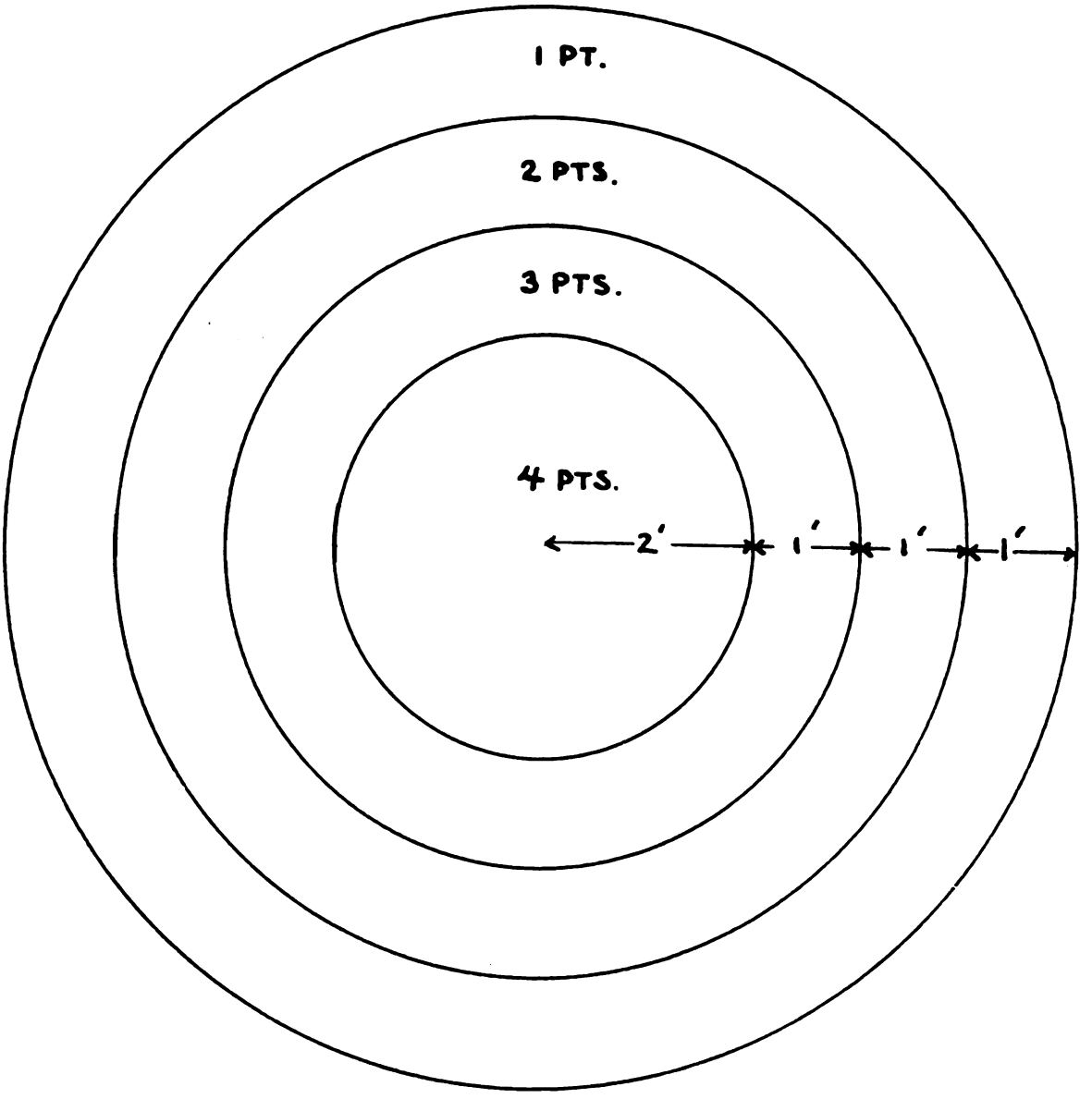

FIGURE * 3

AUTREY'S DRIVING TARGET FOR BRASSIE

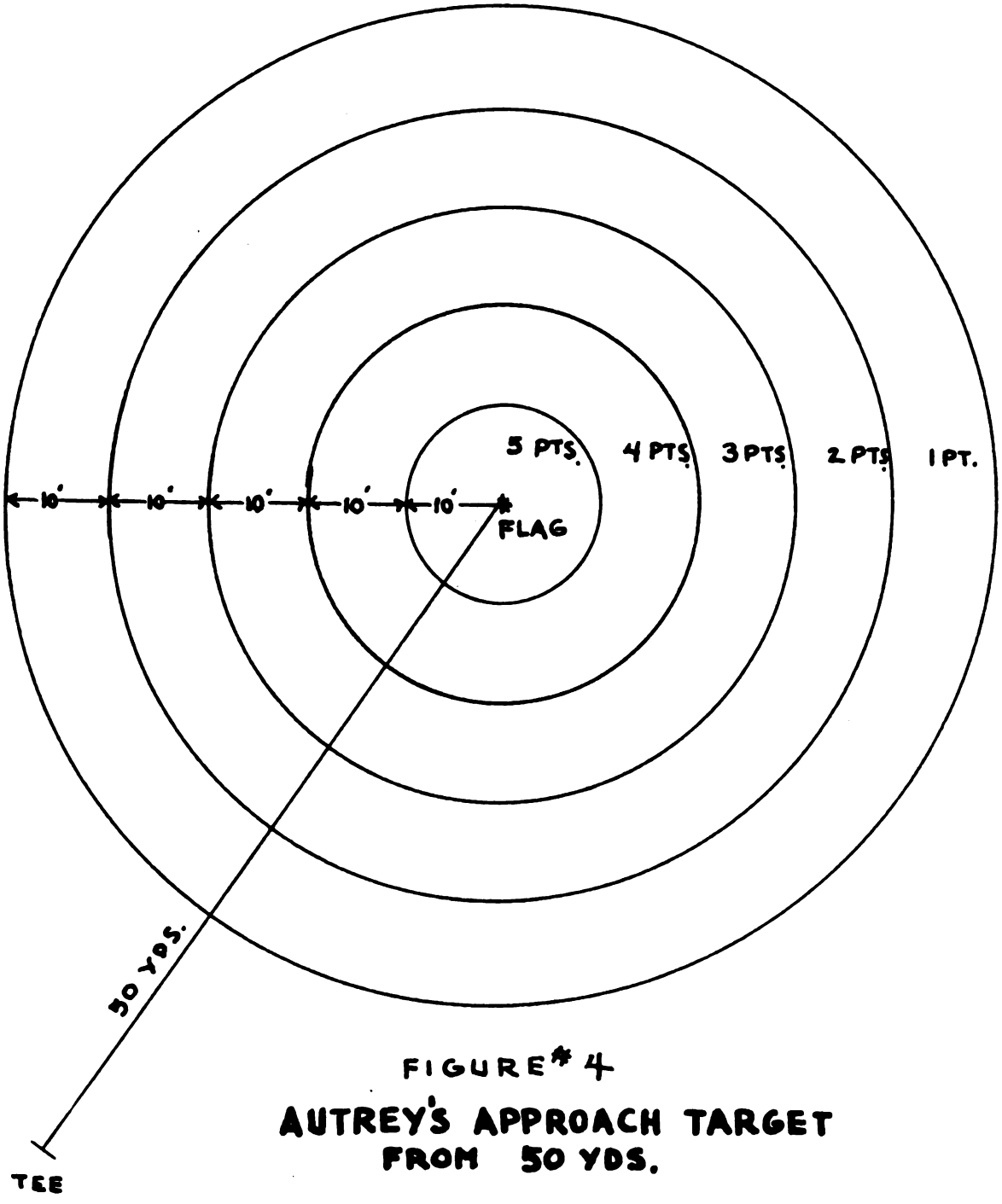

FIGURE # 4

AUTREY'S APPROACH TARGET
FROM 50 YDS.

1. Short Pitch Test. A bushel basket was tilted to a forty-five degree angle. Shots were taken from varying distances in an attempt to land in the basket. No scoring system was offered.
2. Longer Approach. Shots were taken from a distance twenty-five to one-hundred yards at a flag planted in the center of five concentric circles. The inner circle had a radius of ten feet, and each of the others was ten feet larger. Points scored were five, four, three, two, and one, from the center out. This was identical to Autrey's target except for the distance from tee to target.
3. Putting. Very little was said about this test except that the putting was done on a rug covered with sand. Balls were hit toward a spot in the center which represented the hole.
4. The Drive. An area 300 yards long and sixty yards wide was laid out with lines corssing at the 100 and 200 yard marks. Players hit the ball to see how far and accurately they could drive. Three shots were taken and the total yardage of all three represented the score.

None of the above tests were established with a definite purpose in mind, but rather as some games that "could be used along with golf instruction."[7]

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[7]Autrey, op. cit., p. 12.

An anonymous writer constructed a test of pitch shots toward a hole cut in a slanted canvas.[8] Those balls which did not go through the hole rolled back down the canvas and returned to the player. This test might have been fairly successful, had a scoring system been worked out.

Mechanical Tests. Two mechanical methods of measuring golf ability were developed and placed on the market. The first of these was the Golf Register.[9] An aluminum trough was fitted with a length of heavy rubber to which a golf ball was attached. The amount of rubber that was pulled out when the ball was hit indicated the distance the ball would have gone, marked in yards. The ball was also centered on a spindle which indicated the direction the ball spun, if any, when hit. The entire apparatus, anchored at the end where the ball was placed, swung with the direction of the drive, right or left. Thus, the direction of spin, distance and deviation from a straight line were all measured. Through a very popular and interesting mechanism, Glassow and Broer did not feel that it was a valid and reliable test.[10]

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[8]G. J. Rehling, "A High School Golf Program," Scholastic Coach, XI and XII (November, 1941), p. 31.

[9]Golf Register Co., 10 East 42nd Street, New York.

[10]Glassow and Broer, Measuring Achievement in Physical Education (Philadelphia, 1931), p. 189.

The second commercial golf mechanism was the Bobbie Meter, which measured the distance of the drive only.[11] A fake ball was attached to the end of an arm. When the ball was hit the arm revolved around and indicated the distance that might have been made had the ball been a real one. Miss Autrey experimented with this test and found that it had a reliability score of .62 for forty-three cases.[12]

Knowledge Tests. Several people have written golf knowledge tests that were very valuable, but not as an aid to measure the skills of the game. Two of these best known for their knowledge tests were Mary Murphy[13] and Catherine Snell.[14]

Research in Other Aspects of Golf. At least two authors have delved into the game of golf from a research standpoint, with no attempt to seek a method of measurement In 1937, Adams wrote of his investigation to determine what relation there was between the distance to the hole and the number of strokes required to play that hole.[15] Schudel approached the game from still another aspect by studying

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[11]Goergell Company, P.O. Box 1275, New Britain, Conn.

[12]Autrey, op. cit., p. 12.

[13]Murphy, op. cit.

[14]Catherine Snell, "Golf, Riding, Tennis, Baseball, Knowledge Tests," Research Quarterly, VI (May, 1936), p. 77.

[15]Henry Adams, "A Statistical Analysis of Golf," Journal of Applied Psychology, XXI (August, 1937), p. 384.

the respiration processes of a golfer as he drove and putted.[16] Neither study contributed anything to testing the skills of the sport.

Recently, a method was devised to compare the results of approach tests which used a regular golf ball and a cotton ball. It was found that the cotton ball could be used for practice with good results in predicting possible range.[17]

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[16]Helen Schudel, "A Study of the Respiration of Golfers During the Drive and Putt," Research Quarterly IV (May, 1934), p. 62.

[17]Mary Ellen McKee, "A Test for the Full Swinging Shot in Golf," Research Quarterly, XXI (March, 1950), p. 46.

CHAPTER III

METHOD OF PROCEDURE

The designing of a golf skill test was the purpose of this investigation. The investigator's main concern was to isolate the factors that contributed most in golf scoring. In this manner, a prediction of golf scores was attempted. Tests that were developed for use in this study were:

1. Driving Test for distance and accuracy.
2. Five-Iron Test for distance with whiffle ball
3. Five-Iron Test for distance and accuracy.
4. Chipping Skill Test.
5. Knowledge Test.

General Knowledgments.

1. 205 college Freshmen were tested. They were chosen at random.
2. The weather was approximately the same in collecting the data throughout this study.
3. Clubs, balls and tees were provided, while players could use their own clubs if they so desired.
4. In all tests, golf balls were used except for the one Five-Iron Test which required whiffle balls.
5. In the Drivers, Five-Iron and Chipping Tests, various colored balls were used to speed up procedures of testing.
6. The balls used in the tests were similar to the balls that the subjects used when playing for their golf scores.

7. Golf scores were collected at the approximate time of the tests.

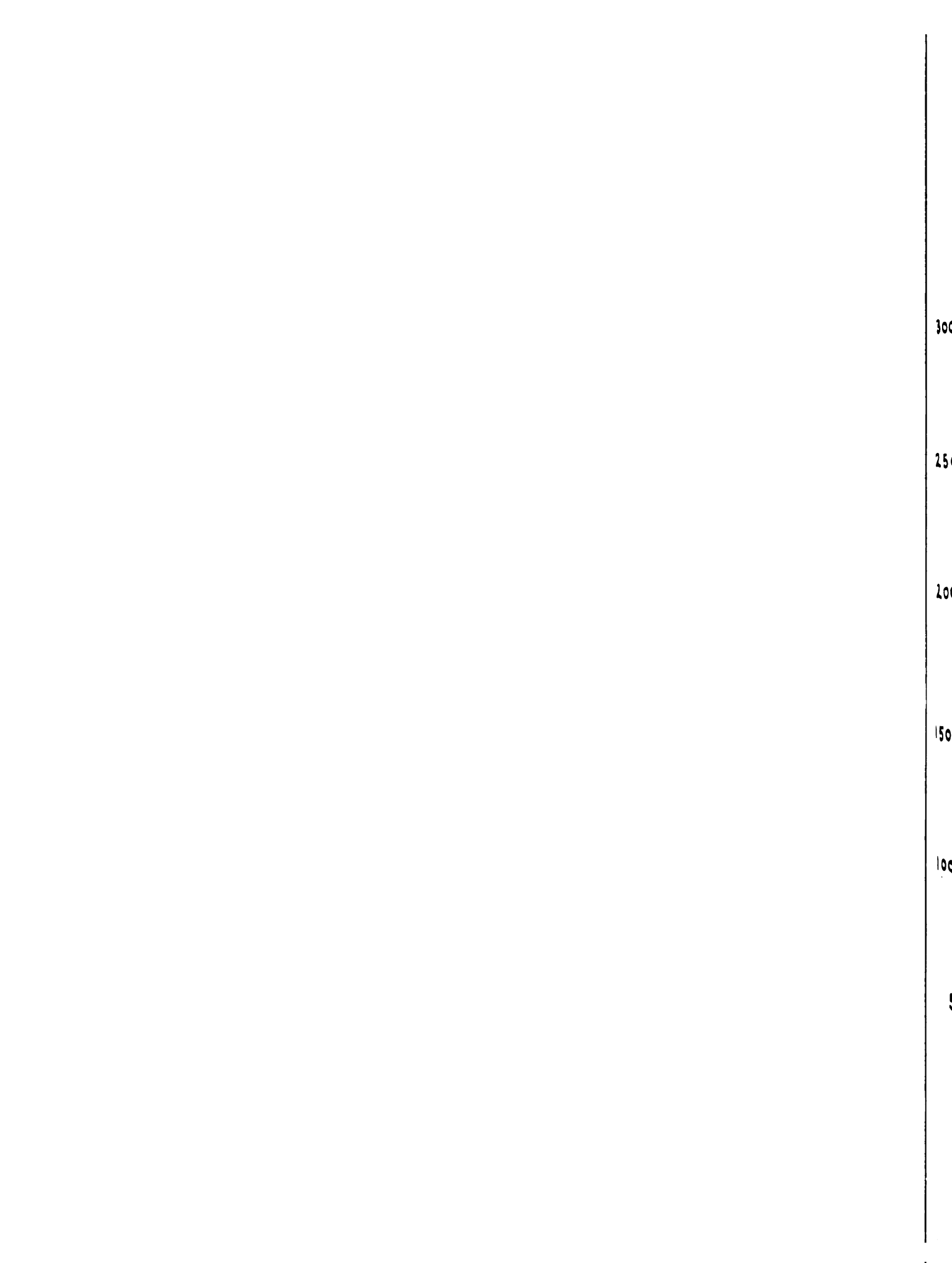
8. Every subject attempted each test only once to limit improvement by practice as much as possible.

Driving Test with One-Wood. In attempting to construct a suitable test to measure distance and accuracy, many driving tests were examined, but these tests did not test accurately enough to meet the need of the study. Most driving tests measured separately either distance or accuracy. The investigator wanted to construct a test that would measure both, because a 300 yard drive hit off to forty-five degrees, is the same as 212.2 yards drive on a straight line to the target. In a like manner, a ball that is hit in a straight line, but only travels fifty feet, is not a fair way of evaluating a shot. Three ways of measuring both distance, and accuracy were developed. The first method devised was the use of a driving net that was squared off and marked so that accuracy could be measured. The second method was to set up a sound recorder to measure the sound (in decibels) of the hits from the ball meeting the club, and equating the degree of sound to distance. This proved to be highly impracticable because of time, expense, and equipment required. Also, accuracy in this test can't be measured exactly. The second test the investigator gave consideration to was the construction of chalk cords between goal posts to be used as a scoring device. The cores would be strung in such a manner that two foot squares were formed;

then by noting the square through which the ball passed, and measuring the distance of the particular drive, accuracy and distance were determined. This test led to the conviction that the best possible way to test an individual's drive was to measure the angle of flight and also the distance by use of grid squares on a driving area. Since these tests were to simulate actual game conditions, the investigator used his third test in this study.

The procedure used in this test was to line off a driving area eighty yards wide by 300 yards long in squares measuring fifty yards in length and twenty yards in width as shown in Figure #5. Five subjects were tested at a time. Various colored balls were used to speed up procedure. In this way, twenty subjects could be measured before charting the scores, since it was assumed that learning takes place with practice, trial shots weren't permitted. The test required a large amount of space but since the correlation of the test with the golf score was high it is assumed that the large space required was justified. A driving net would suffice if space was limited, but the disadvantage of this is that a ball starting to the right might hook into the middle. It was thought to be important to score the ball where it came to rest, not how it arrived.

The scoring formula adopted for the Driving Test, as shown in Figure #5, awards six points to a drive that is lying over 250 yards off the tee, and within twenty yards of the center line of the grid. Figure #5, is constructed in


300
250
200
150
100
5

DRIVING FIELD LAYOUT FOR #1 WOOD

0 300 YDS	5	6	6	5	0
0 250 YDS	5	6	6	5	0
0 200 YDS	3	5	5 * FLAG	3	0
0 150 YDS	2	4	4	2	0
0 100 YDS	1	3	3	1	0
0 50 YDS	0	1	1	0	0
0	0	0	0	0	0

← 20 YDS. →

5 TEES

FIGURE # 5

a self-explanatory nature. Note that a zero is scored for a shot lying outside of grid lines, since this area would probably be out of bounds. The 205 subjects that were tested hit ten drives each with a limit of ten practice swings. It was possible for each subject to score sixty points on this test item.

Five-Iron Test. On this test item, accuracy and distance were measured. A grid system on a driving area was used. The scoring area, Figure #6, was constructed in such a manner that one was penalized for hitting at an angle which is what happens when playing the actual game. Each subject was scored on ten shots for a possible total of one-hundred points. Five subjects were tested at a time. Ten practice swings were allowed before beginning the test. Colored balls were used to speed up procedures.

Chipping Test. A Chipping Test for accuracy was constructed in such a manner that extremes could be measured. Most previous chipping tests constructed measured factors such as where the ball hits, how much the ball rolls, or where the ball comes to rest. The only important factor involved in hitting any golf shot is where the ball comes to rest.

The Chipping Test was constructed using concentric circles as in Figure #7. Five points were awarded to a ball lying within the seven foot circle, and one point to a shot within the twelve foot circle. The investigator felt

	8	10	10	8	
200YDS.					
	7	10	10	7	0
175 YDS					
	4	8	FLAG *	4	0
150YDS					
	3	6	6	3	0
125 YDS			10 YDS		
	2	4	4	2	0
100YDS					
	1	3	3	1	0
75 YDS					
	0	2	2	0	0
50 YDS					
	0	1	1	0	0
25 YDS					
	0	0	0	0	

5 TEES
FIGURE*6

CHIPPING TARGET ON THE GREEN

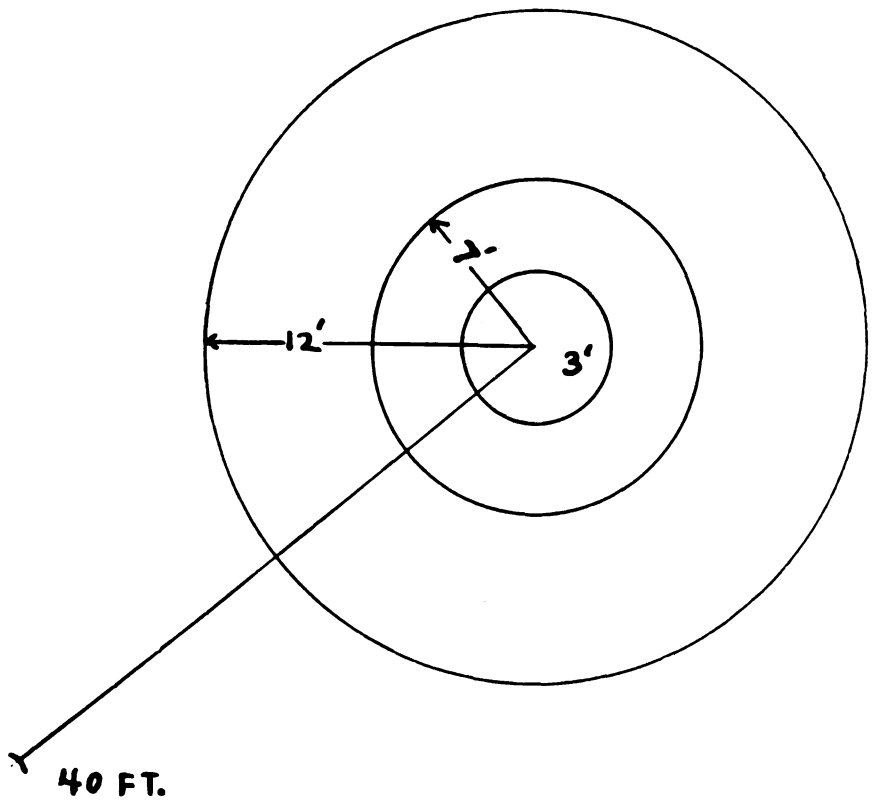


FIGURE* 7

that an accomplished "Chipper" should be able to hit the ball most of the time within three feet from the pin from a distance of forty feet. An actual green was used in this test. Only two subjects were tested at a time to prevent balls from hitting one another and being displaced. Each subject hit twenty balls for a possible total of one-hundred points. A Seven-Iron was used for chipping on this test.

Putting Test. The putting test was conducted on an actual green. The putting line was twenty foot from the hole. Thirty-six scoring areas, each nine inches square, were marked off on the green as shown in Figure #8. Balls that stopped slightly short of the hole were considered to be lower in point value than balls that traveled slightly beyond the hole, as a hard putt often rolls into the hole. The putt was scored from the point where the ball stopped. Twenty trials were permitted. A possible 200 points could be accumulated. Figure #8 shows the layout that was used in the test.

Five-Iron Test With Whiffle Ball. The Five-Iron Test now being used by the HPR 105 Foundations Course at Michigan State University was used in this study. The only change was the lengthening of the scoring areas to measure the ability of the better performer. The length was originally sixty feet, but the investigator changed this to sixty-eight feet. In the appendix the original test is shown. Each player was permitted five trials for a possible total of

PUTTING TEST

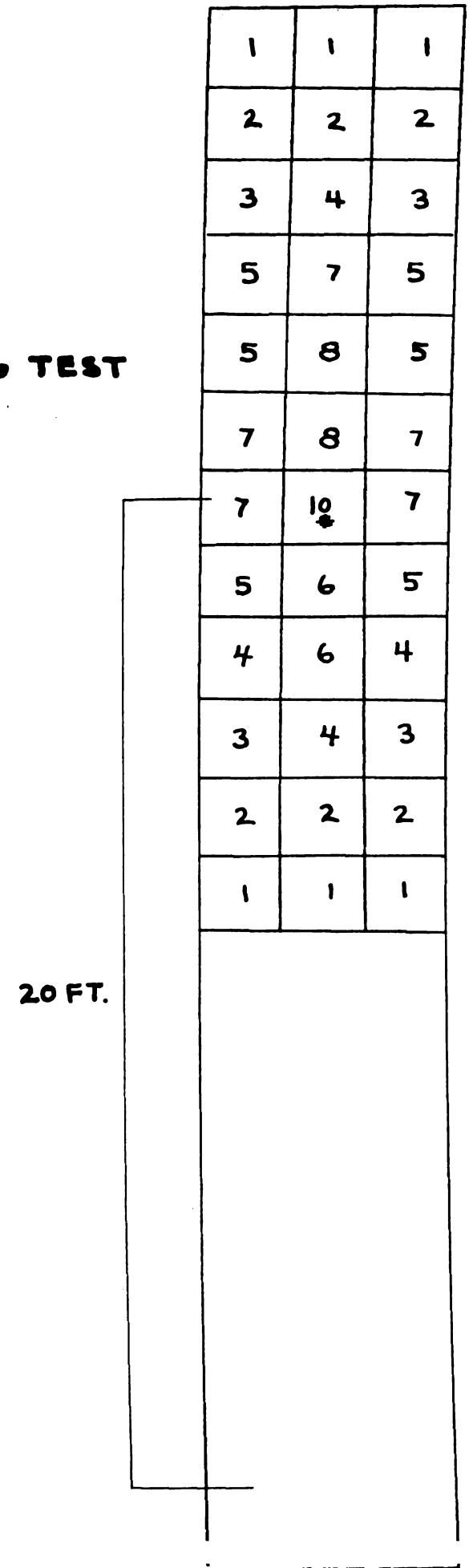


FIGURE 8

fifty points. Ten practice swings were permitted. The ball was first scored where it touched the ground. All "misses" were scored as zeros. Figure #9, shows this layout.

Actual Golf Scores. All golf scores were received after all six tests were taken. The scores were taken from the long tees at Michigan State University's Course which measures 6980 yards. The course is wide open in nature with at least two sand traps around each green. The greens are large and putt very true. Most of the greens are slightly slanted in the favor of the golfer hitting into the green.

Golf Knowledge Test. Murphy's Knowledge Test was selected from 200 items in six of the leading texts on golf and twelve articles.[18] The test itself consists of fifty true-false statements on General Technique Information, thirteen Completion Statements under the heading of "Recall of General Technique," and thirty statements requiring matching of terms on General Information. The reliability coefficient was computed by Spearman's formula for chance halves (r+ .92). This test was scored in percentile since there were one-hundred points possible.

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[18]Murphy, op. cit., p. 81.

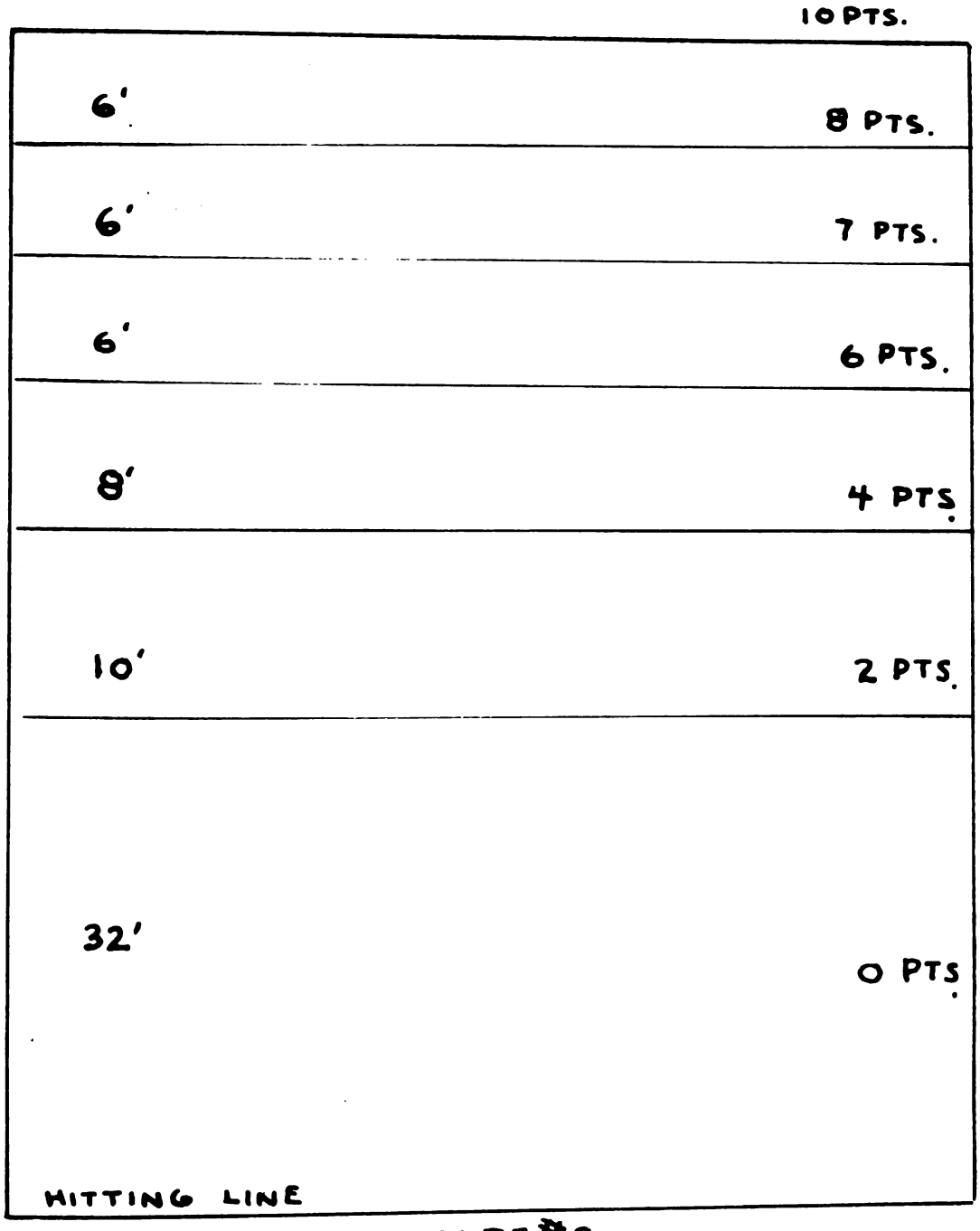

FIGURE #9

5 IRON WHIFFLE BALL TEST

CHAPTER IV

RESULTS, INTERPRETATIONS AND ANALYSIS OF DATA

The purpose of this study was to develop a skill test that could be used for predicting a student's score. Four skill test items were designed and administered by the investigator to 205 subjects. Also, a Knowledge Test and a Five-Iron Whiffle Ball Test was given. These test items were not designed by the investigator. The Whiffle Ball Test was included to check it's correlation with an actual Five-Iron Test and a subject's score.

The data was analyzed to determine: (1) What single factor would best be used to predict a subject's score; (2) What combination of factors could be used to predict a subject's score: (3) Does a correlation exist between the Five-Iron Tests; (4) Does the Whiffle Ball Test correlate with a subject's score. Multiple correlation and factoral analysis were the statistics used for determining the results of this study. Since the investigator used these statistics, both the reliability and validity were exploited. The results of this study are presented in tabular form on the following page.

Summary of Findings.

1. The putting skill test designed in this study could be used to predict a subject's scores.

2. A combination of putting and chipping could be used for predicting subject's score.

3. A very low correlation exists between the scores of the Whiffle Ball Test and the Five-Iron Test.

4. No correlation exists between the Whiffle Ball Test and an actual score.

TABLE I

CORRELATIONS

	Test	Score
1.	Knowledge Test with Score =	-.177
2.	Whiffle Ball Test with Score =	-.046
3.	Five-Iron Test with Score =	-.208
4.	Driving Test with Score =	-.319
5.	Chipping Test with Score =	+.364
6.	Putting Test with Score =	+.792
7.	Whiffle Ball Test with Five-Iron Test =	+.100

TABLE II

FACTORIAL ANALYSIS

	Test	Score
1.	All factors with score =	+.603
2.	Chipping and putting with score =	+.878
3.	Whiffle ball, chipping and putting with score =	+.865

This study indicated that it would be possible to predict golf scores best by using the Putting and Chipping Tests that were designed for this study. Since only 205 subjects were used, true prediction of golf scores from the Chipping and Putting Tests was not attempted. More subjects were needed to establish norms for these tests.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary. The purpose of this study was to design a golf skill test that would help in predicting a student's score. A secondary purpose was to evaluate the Five-Iron Whiffle Ball Test used at Michigan State University. The subjects were chosen by stratified random sampling from Michigan State University. The place of Residence of the subjects was limited to the United States and Japan. Only four subjects were from the latter country.

The total number of subjects included in the study was 224. Two-hundred and five subjects filed complete data that was used in the statistical findings.

Only two tables were required for the necessary information. These tables were analyzed for the obtained results.

There have been no other studies of this kind attempted that the investigator could find; therefore, he felt this was an original study.

This study should certainly help the physical educator or golf instructor in predicting golf scores. It should also generate more interest in evaluation of golf playing ability.

Conclusions. The following conclusions seem justifiable in view of the limitations of this study:

1. A subject's score can be predicted from the single factor of putting. A + .792 correlation was very high in view of the many factors that make up a golf score. This certainly is significant.

2. The combination of the Chipping and Putting Tests proved the best tests for predicting golf scores.

3. The Whiffle Ball Test did not correlate with either the golf score or a Five-Iron Test.

Recommendations. Recommendations for the improvement of this and future studies of this nature are:

1. Similar types of studies should be made in all sports.

2. The Driving Test might be redesigned in order to be used where space is a limiting factor, but this test had a minus correlation with an actual score.

3. The weather was ideal for this study, but future studies would be taking less of a chance if they were held in the summer.

4. The putting and chipping tests designed were excellent for the needs of this study. These were easy to administer and are the best tests designed by the investigator to predict a golf score. Other lengths of putts need to be investigated.

5. A better indoor test than the Five-Iron Whiffle Ball Test needs to be developed.

BIBLIOGRAPHY

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Adams, Henry. "A Statistical Analysis of Golf," Journal of Applied Psychology, XXI, 384, August, 1937.

Autrey, Elizabeth. "A Battery of Tests for Measuring Playing Ability in Golf" (unpublished masters Thesis, University of Wisconsin, 1937), p. 10.

Broer, G. "Measuring Achievement in Physical Education," Philadelphia: W. B. Saunders, 1939, p. 189.

Clevett, Melvin. "An Experiment in Teaching Methods of Golf," Research Quarterly, I, December, 1931, p. 104.

Georgell Company, P.O. Box 1275, New Britain, Conn.

Golf Registar Co., 10 East 42nd Street, New York, N.Y.

Griffith, Coleman. "An Experiment on Learning to Drive a Golf Ball," Athletic Journal, II, 1931, pp. 11-13.

McKee, Mary Ellen. "A Test for the Full Swinging Shot in Golf," Research Quarterly, III, September, 1933, p. 81.

Murphy, Mary. "Criteria for Judging A Golf Knowledge Test," Research Quarterly, III, September, 1933, p. 81.

Rehling, C. J. "A High School Golf Program," Scholastic Coach, XI, and XII, November, 1941, p. 31.

Schleman, Helen Group Golf Instruction, New York: A. D. Barnes and Company, 1934, p. 49.

Schudel, Helen. "A Study of the Respiration of Golfers During The Drive and Putt," Research Quarterly, IV, May, 1934, p. 62.

Snell, Catherine. "Golf, Riding, Tennis, and Baseball Knowledge Tests," Research Quarterly, VI, May, 1936, p. 77.

Woods, Isabel. "A Study for the Purpose of Setting Up the Specifications of a Golf Driving Cage Target and Test for the Mid-Iron and Brassie Clubs" (unpublished Masters Thesis, University of Wisconsin, 1937), p. 10.

APPENDIX

GOLF KNOWLEDGE TEST

Name_____ Date_____

DIRECTIONS: About one-half of the following statements are true, and about one-half are false. Mark each true statement with a + sign on the ditted line at the left of the statement. Mark each statement that is partly or wholly false with a 0 on the dotted line at the left of the statement.

50 True-False on General Information on Technique.

1.... A wide stance is preferable to a narrow stance.

2.... One must "get his body" into a tee shot to gain distance.

3.... The radius of one's swing extends from the jant of the left shoulder to the clubhead.

4.... On the downswing, the left arm should be bent.

5.... The left hand and arm should be a "passenger" on the downswing.

6.... A narrow stance enables one to turn freely at the hips.

7.... In order to get weight into tee shots a free body turn or pivot is necessary.

8.... A worth-while tip is, at the top of your swing, to have the heels of your hand seemingly pushed forward.

9.... A rigid left arm is necessary in driving.

10.... At the top of a swing the right arm is straight and the left elbow is close to the left side and pointing down to the ground.

11.... One should depend upon roll and not upon carry for distance.

12.... The clubhead should meet the ball at the lowest point of the swing-through.

13.... The loft of the face of the driver, and striking the ball at the lowest point of the swing-through causes the ball to fly upward.

14.... The right knee bent slightly toward the ball and slightly inward toward the left causes the right side to tighten during the swing.

15.... The main idea of the swing is to hit the ball.

16.... Golf, especially driving, is done with the right arm in control, a straight right arm, too.

17.... A stiff right knee tends to brace the right side and to make for correct right hip action during the backswing.

18.... The weight should shift to the ball of the sole of the right foot on the backswing.

19.... Golfers who average exceptional distances from the tee, use little wrist action in the swing.

20.... Players who use plenty of wrist action drag the club back, the hands leading because the left wrist is bent so that the hand points toward the ball.

21.... In driving the clubhead should be taken back from the ball (along the line of flight extended back of it) for as great a distance as possible.

22.... Swaying is caused by good pivoting.

23.... A narrow stance tends to make one sway.

24.... The left arm in control on the backswing tends to push the head of the club out from one beyond the line of flight.

25.... A player with a wide stance places the ball to the right of a point off the left heel.

26.... A player with a narrow stance plays his ball off the left instep.

27.... At the top of a swing for a drive the right elbow should be out from the body and point backward.

28.... The grip of the right hand should be tight on the first part of the downswing.

29.... Pressing concerns itself with hitting too late.

30.... Most golf faults come from trying too hard.

31.... The loft on all wooden and iron clubs, graduating in scale from the 80 per cent of a driver to the 50 per cent slope of a niblick, supplies the angle of carry.

32.... The left wrist should be bent a bit at address and that hand permitted to take back the club.

33.... Pressing is hitting too hard.

34.... Every ounce of power may be applied through proper timing.

35.... At the end of a pitch shot, the right hand is over the end of the club.

36.... In heavy rough, the mashie should be taken back low and close to the ground with the left hand.

37.... On a pitch shot speed is the dominating feature.

38.... One point all crack "pro's" have in common is a hip slide.

39.... A hip slide, is the gliding forward of the hips on a line parallel to the line from the ball to the pin.

40.... Most players on a pitch shot hit the ball too soon.

41.... In mastering the run-up shot the head must be kept down and stroke on through after contact in such manner that the clubhead will follow on line after the ball.

42.... The loft on the chip shot should be sufficient to make the ball bounce over the last third of its journey.

43.... The chip shot should be played from a point midway between the feet.

44.... To prevent the arms getting away from you on the run-up shot place the left forearm on the left leg.

45.... On a pitch shot the club should be taken back with the right hand with only a wrist movement.

46.... To pitch over a bunker a right hand control with a bent left wrist raises the clubhead more quickly from the turf.

47.... In putting, the players are advised to use a tight grip.

48.... A short putt missed does not count as much as a long drive.

49.... The head of the putter should be kept low along turf in going back and higher in hitting through after the ball.

50.... Players who stand with feet well apart in putting usually place most of the weight on the left foot.

13 Points on Recall of General Technique

1. When your hands or body or both get ahead of the clubhead, it is called_____

2. Hurry your backswing, and not only overswing, but pull yourself off_____

3. On the backswing control is lost when the_____ get too far back.

4. The follow-through is a result of swinging the_____ _____ through the ball from inside the line of flight with the_____ following low and close to the ground before and after contact.
5. After contact with the mashie, the knuckles of the _____ hand and palm of the_____ hand are up.
6. For thick rough, grip mashie with the_____ two fingers and thumb of each hand and wrists_____
7. To lift a mashie quickly in thick rough, lift it with the _____ hand.
8. The left thumb placed down the back of the leather will stop the _____ on little chips and pitches.
9. On a chip shot one should guide the _____ with necessary exactness.
10. Do not take _____ on the chip or run-up shot.

30 Points of Matching Terms on
General Information

Write on the dotted line to the left of letters of the alphabet the proper numberal that associates the truest meaning.

Shots

1.	Pitch	.... a.	Distances up to twenty yards.
2.	Lofted shot	.... b.	Bunker
3.	"Explosion" shot	.... c.	Deep bunker
4.	Ordinary swing with mashies	.... d.	Accuracy dominating feature, with all "stop" possible.
5.	Chip	.... e.	Shallow bunker

Drives

1.	Keep right knee slightly bent throughout backswing	.... a.	With the distance to be traversed.
2.	Swaying	.... b.	Shoot to the right
3.	Length of swing varies	.... c.	Lowest point of the arc.

4.	Iron Shot, Elbow bent when contact made.	.... d.	To prevent the right hip from swaying.
5.	Clubhead gains maximum velocity	.... 3.	Leaning the body out to the right and gather the arms there for a hit.

Clubs

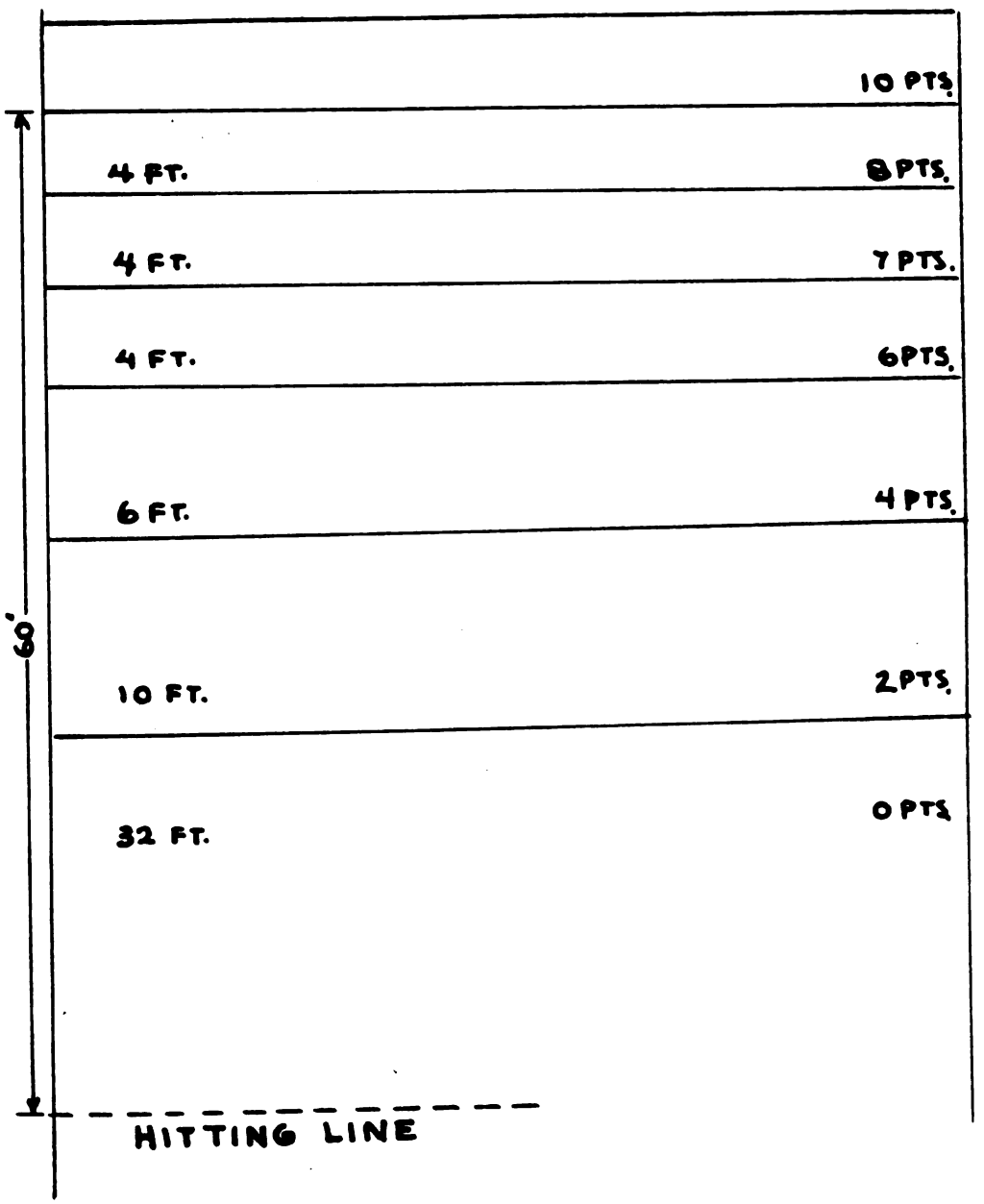
1.	A compromise between a niblick and Mid-Iron.	.... a.	Niblick
2.	To be used when the ball lies in bad places, as ruts, weeds.	.... b.	Spoon
3.	A club with a convex face	.... c.	Mashie
4.	An iron-headed club of considerable driving.	.... d.	Cleek
5.	A wooden-head club fashioned so as to lift the ball.	.... e.	Bulger

Terms

1.	One under par for a hold	.... a.	Down
2.	A reverse spin imparted to the ball which prevents roll.	.... b.	Draw, hook, or pull
3.	Competition by hole	.... c.	Away
4.	Competition by stroke	.... d.	Face
5.	Ball to be played first	.... e.	Dormie
6.	The part of the club which strikes the ball.	.... f.	Medal play
7.	To drive widely to the left.	.... g.	Birdie
8.	To evate the ball.	.... h.	Cut
9.	Number of holes or strikes a player (or match) is behind opponent	.... i.	Match play
10.	As many holes ahead as there remain to play.	.... j.	Loft

Miscellaneous

1.	Putting	.... a.	Left foot advanced
2.	To keep the ball low	.... b.	Lack of body motion
3.	Closed stance	.... c.	Lowest point of arc
4.	Tendency to look up before actually hitting the ball	.... d.	Short game is being played
5.	Maximum Velocity	.... e.	Play it more off the right foot, with the weight on the left.



ORIGINAL 5 IRON WHIFFLE BALL TEST
USED IN 105 FOUNDATION CLASS
AT MICHIGAN STATE UNIVERSITY